PCT/ IB 04/03674

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P01/7700 0.00-0326106.2

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Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

1. Your reference	RH/DAS/SEB/P/76120.GB/B
2. Patent application number *(The Patent Office will fill in this part)*	0326106.2
3. Full name, address and postcode of the or of each applicant *(underline all surnames)*	MELEXIS NV Microelectronic Integrated Systems Rozendaalstraat 12 B-8900 Ieper Belgium
Patents ADP number *(if you know it)*	8351702001
If the applicant is a corporate body, give the country/state of its incorporation	Belgium Corporation
4. Title of the invention	PLASTIC FIBRE OPTIC INTERFACE
5. Name of your agent *(if you have one)* "Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*	WILSON GUNN SKERRETT CHARLES HOUSE 148/9 GREAT CHARLES STREET BIRMINGHAM B3 3HT UNITED KINGDOM
Patents ADP number *(if you know it)*	7710734001

	Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*
6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number			

	Number of earlier application	Date of filing *(day / month / year)*
7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application		

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*
a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
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a)

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9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	
Description	5
Claim(s)	
Abstract	
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10. If you are also filing any of the following, state how many against each item.

Priority documents	
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Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature	Date
Wilson Gunn Skerrett	10 November 2003

12. Name and daytime telephone number of person to contact in the United Kingdom

Mr R Hill
0121 236 1038

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Notes

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PLASTIC FIBRE OPTIC INTERFACE

The invention relates to a method of connecting a plastic fibre optic to an integrated circuit containing a light sensitive element.

Digital communications are increasingly being specified for use in automotive and other consumer systems and there is a growing move to use optical transmission methods for reasons of speed, bandwidth and immunity to interference along the transmission medium. Traditionally optical transmissions systems have used glass fibres for the optical medium. Such fibres have low transmission losses and are essential in long distance telecommunications. For shorter range transmissions, for example around a home or a vehicle, much higher transmission losses can be accepted whilst still achieving the desired levels of data rate and error rate. Over shorter distances the transmitted power can also be reduced whilst maintaining adequate received signal. Plastic Optical Fibre (POF) can be used in place of glass fibres in such shorter range communications systems.

However, POF has a greater diameter than glass fibre, being approximately 1000 micron in diameter compared with approx 100 micron diameter for a glass fibre. To extract the maximum optical energy from the fibre in any application requires good optical coupling between the fibre and the light sensitive element. For high speed transmission the switching speed of the light sensitive element must be high. To achieve high speeds the size of the light sensitive element must be kept as small as possible to keep down the inherent capacitance of the element since a large device with a large inherent capacitance will be slower than a small device with lower capacitance.

The connection of the glass fibre with the small light sensitive area has led to difficulties in manufacture and to special package designs that can be more expensive than equivalent sized conventional integrated circuit packages and which are not suitable for the use POF with its larger diameter.

It is the object of the present invention to provide a POF interface with which a POF can be coupled to a silicon integrated circuit containing a small light sensitive area thereby reducing the cost. Good coupling efficiency can be arranged by the inclusion of a mirror mounted on the silicon integrated circuit.

Thus and in accordance with the first aspect of the present invention there is provided an interface for connection of a plastics fibre optic to an integrated circuit, the circuit including a light sensitive element, the interface including at least one reflector for mounting on a surface of said integrated circuit, said reflector being adapted to receive the optical fibre into optically coupled connection therewith.

In accordance with the second aspect of the invention there is provided a method of connecting a plastics fibre optic to a light sensitive element on an integrated circuit, said connection being made by mounting at least one reflector on said integrated circuit and opaically coupling a fibre optic to said at least reflector.

The invention will now be described further with reference to the accompanying drawings of which:

Figure 4 shows an assembly in accordance with a second embodiment of interface in accordance with the invention.

Referring now to the figures, Figure 1 shows a silicon integrated circuit or die 102, having on one side thereof a light sensitive area 101, is mounted on a substrate 105. A reflective moulding 103, is moulded to have an orifice 104, the orifice being open at opposite ends thereof. The orifice 104 has shaped and reflective surfaces 107. The moulding 103 is mounted onto the die 102 with one of the open ends aligned with the light sensitive area 101.

The orifice 104 in the reflective moulding 103 is adapted at the second open end thereof to receive a Plastic Optical Fibre (POF) into connection therewith.

The reflective moulding 103 can be mounted on the die 102 in any suitable manner. For example, suitable adhesive material can be used.

The reflective moulding 103 may be further shaped to additionally make contact with the substrate 105 on one or more sides of the die 102.

In use, the reflective moulding 103 is mounted onto the die 102 and the POF is connected to one open end of the orifice 104. The connection may take place in any suitable manner which allows optical coupling of the POF to the moulding 103. The light passing through the POF is thus directed by the orifice 104 onto the light sensitive area via the other open end thereof.

Figure 2 shows a plan view of the embodiment of figure 1.

It can be seen that the die 102 extends beyond the reflective moulding 103 on at least one side to enable electrical connections 106 to be made between the die 102 and the substrate 105.

The die 102 contains a suitable electronic circuit connected to the light sensitive area 101 to process signals generated by the light sensitive area 101 and to generate signals more suitable for use in the application in which the POF interface is intended to be used.

Figure 3 shows a plurality of reflective mouldings which can be moulded as an array of reflective mouldings 201 as shown in the figure. The repeat dimensions of the reflective moulding array are the same as the step and repeat dimensions of the die when in silicon wafer form. The reflective moulding array is mounted onto a wafer 202 of die containing light sensitive elements, with the first open ends of the orifices 104 aligned with the light sensitive areas of the die. The reflective moulding array is preferably attached to the wafer 202 using a suitable adhesive. Alternatively the array can be fixedly attached in any other suitable manner, as desired or as appropriate.

The combined wafer and the reflective moulding array can be separated into individual die and mirror moulding assemblies by sawing, laser scribing or any other known semiconductor separation techniques or a combination of two or more such techniques.

The individual die and reflective moulding assemblies can then be mounted onto suitable substrates or into suitable packages using conventional methods of mounting silicon integrated circuits.

In a still further embodiment the reflective moulding can comprise a plurality of cavities (not shown) and the die has a corresponding plurality of light sensitive areas such that when the assembled together in accordance with the invention there is formed a multiple POF interface.

It is of course to be understood that the invention is not intended to be restricted to details of the above embodiments which are described by way of example only.

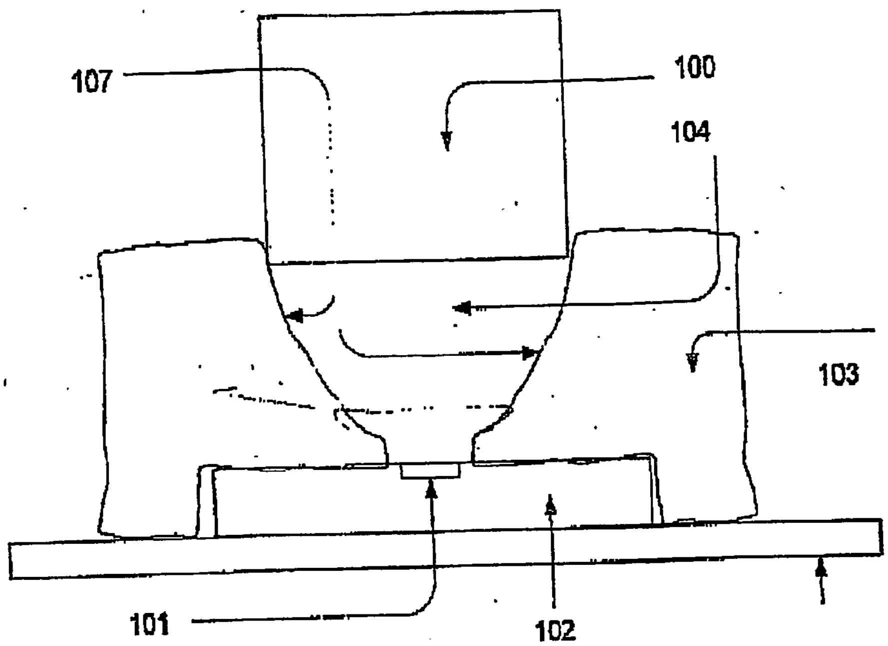

Figure 1

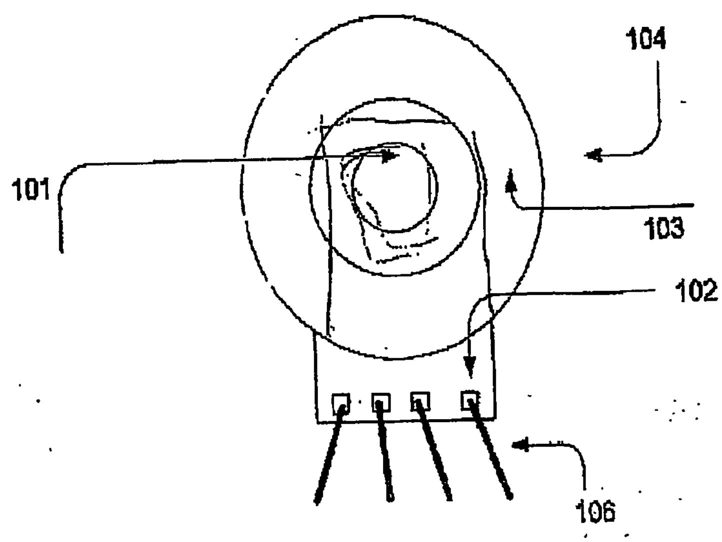

Figure 2

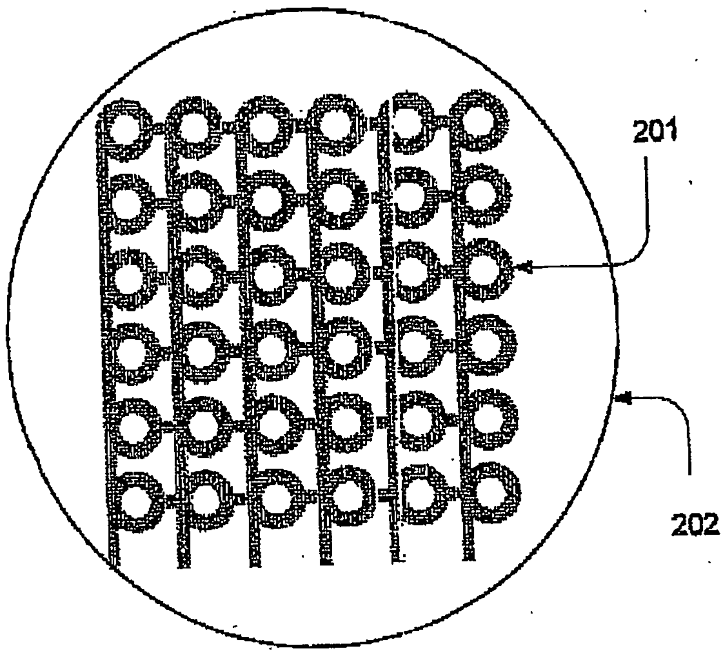

Figure 3

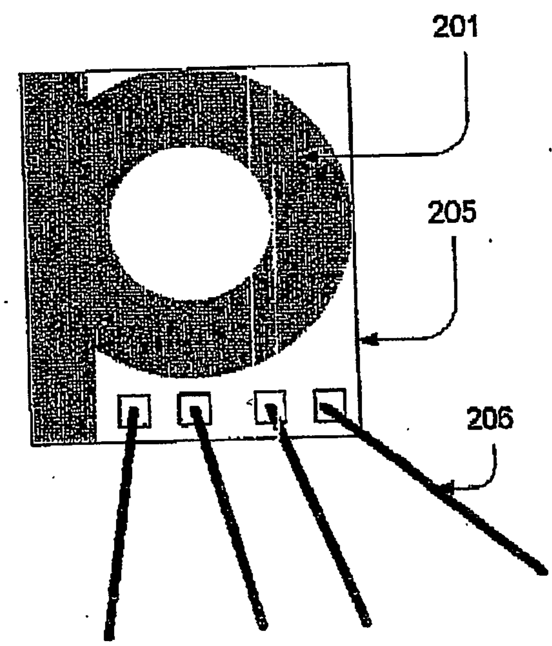

Figure 4

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